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# ***GLOBAL DIGITAL LIBRARY: Technology Is Ready, How About Content?\****

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The widespread global use of the open systems like Internet and World Wide Web (WWW) make it possible for us to experience the reality of all types of "virtual libraries" in the cyberspace. Thus, the "Global Digital Library" (GDL) advocated by the author for a number of years can be a technological reality. Yet, because of the complex and diversified logistical and non-technological problems and issues, many hurdles must be jumped over in order to witness a functional GDL.

While recognizing the importance of many other information infrastructure related problems and issues which are more global in nature, librarians need to be actively participating in working together with other groups in meeting the digital and global challenges. With her own GDL initiative, this author shows how the current seamless GDL prototype has the capability to link many national libraries and some major libraries, archives, museums, and information organizations together. Yet, while technologically the system building is possible, we need to raise a basic question about the readiness of digital "contents" for this global connection. Are we ready to utilize the available global system?

Unquestionably, there is an urgent need for global cooperation in "digital" content building and sharing. Being digital with substantive knowledge content will be the key to a successful GDL. This will be global challenge for librarians at a very tall order!

## **1. INTRODUCTION**

Years ago, futurists like Toffler predicted the coming of a shrinking global village, and today, we are experiencing the true meaning of such a shrinking globe. Caught in the midst of the digital visual information age, excited in both the great technological potentials and the current development of the global telecommunications networks, it is easy to envision the coming of a true "Global Digital Library" (GDL). It is this "Global Library" and its impact on feasibility for universal information access that I have chosen to address.

## **1.1. An Era of Unprecedented Change**

In this last decade, the technological, social and economic changes have been particularly dramatic. Technologically, with the advent of microcomputers, optical discs and other mass storage media, telecommunications technology, digital image technology, computer graphic technology, multimedia technologies, compression technology, etc... have dramatically changed the way we live, think, and communicate with each other, and certainly the way we use and view technologies.

In the last couple of years, the development in communications technology has been so dramatic that we are truly experiencing the incredible power of the open system, Internet. The new technology buzzwords everywhere have been global village, electronic or digital information superhighway, information age, cyberspace, electronic frontier, virtual village, etc... In addition, communications satellites, global trade and investment, and global technology transfer have prompted dramatic social and economical changes as well. These have pushed the national economies into a more integrated world economy. Now, more than ever, as many political barriers removed, we have been able to communicate with each other openly and freely.

## **1.2. Telecommunications, Internet and Universal Information Access**

Since 1960s, we have passed several computer eras -- from the mainframes era in the 1960s to the minicomputers era in the 1970s, to the PCs era in 1980s, and finally to the networks era of the 1990s. The main player of this networks era is the Internet.

Internet started in 1969 by the US Defense Department with its humble beginning and once was exclusively used by American research scientists and computer specialists for e-mail, group discussion and conduct research. But, during this current networks era, it has greatly expanded to become a supranational global digital information superhighway. This global communications network connects networks of federal, regional, academic, private, and foreign users. It is a network of more than 50,000 networks that form the world-wide web. Its membership doubled in 1993 to more than 15 million users, and current estimates put Internet users world wide at much more than 40 millions, but the number is increasing dramatically as commercial online services, such as American Online, Prodigy, and Delphi, get their browsers up and running. It is expected that by year 2000 there will be over 200 million users. There are endless examples illustrating this fast moving networked environment. Let me mention only two examples: American Online (AOL), the largest provider of online and Internet services in the world, has now over 5.5 million members with 900,000 new subscribers in the first three-month period of 1996 as reported by AOL. In February 1996, Steve Case, the CEO of AOL, said, "AOL is now among the largest 'cities' in the world; more people live in the AOL community than in the metro areas of San Francisco, Madrid, or Sydney." Netscape Communications Inc. with its most popular Internet browser, reported its magical growth with an installed base of more than 38 million users. In addition, the Netscape web site receives 80 million hits per day and has served more than 10 billion hits since its launch in 1994. Clearly the WWW has opened a new distribution channel for whatever types of information electronically published in the cyberspace.

### **1.3. Shift Toward a Global Learning-Oriented Society**

With all the unprecedented changes, it should not be surprising that there is an increasing demand for better access to needed global information to enable us to have a bigger picture on the world in which we are living in, a better global view on our environment, our history, our cultures, our economy, our science and technology, etc... Thus, information, has become the key to productivity, and there is a shift toward a knowledge-based learning-oriented "creative society." In this type of society, we are witnessing the following change in emphasis:

- Societal values change from "acquiring" to "learning"
- Growing motivation of individuals for knowledge
- More people learn to use information creatively
- More demand for multimedia information
- More demand for global information
- More demand for opportunities to interact, to learn, and to engage
- More demand for community than for just information

It is clear then that a changing society characterized by continuing technological progress, societal and economic changes will definitely pose new challenges to libraries. It demands our libraries to transcend traditional methods of providing information access within the confines of library's physical structures to providing access to services and global information resources to people at home, in school, at work, or any place so desired by them [Chen. 1994].

## **2. THE GLOBAL DIGITAL LIBRARY: REALITY AND CHALLENGES**

Because of my active project involvement in interactive multimedia, optical and digital technologies since the early 1980's, it has been easy for me to visualize the potential possibilities for libraries with the coming of the digital visual information age. Thus, for years I have advocated the coming of digital libraries (Chen, 1986; Chen 1990). In the latest few years, the fast-paced development in the expanded use of the Internet for digital publishing on the World Wide Web (WWW) for both commercial and noncommercial purposes has been explosive. Clearly, with the ability for us to talk, write, confer with, or send textual, audio and visual information to anyone else in any part of the world, the landscape for information and for library and information services provision and delivery has changed dramatically. Instead of talking about networking and automation, we are talking about the reality of digital libraries, and the delivery of information over cyberspace (Chen, 1995a, p. ix). But, this is only the beginning. We should also be talking about the provision of a global virtual community for more substantive engaging experience around the knowledge gained. In this respect. I am so very pleased to have the paper by Borbinha and Delgado (1996) to be presented at this conference, which has saved me a great deal of page space to discuss the impact of the Internet and the future new library.

## 2.1. Toward Universal Information Access

As computing and telecommunications develop and merge, we have moved closer toward universal information access. This means that technologically, anyone, anywhere, could talk, write, confer with, or send multimedia -- textual, audio, and visual -- information to anyone else in any part of the world, provided these information sources are digitally available! So, the concept of the digital "Global Library" is both conceptually sound and technological feasible now. Yet, we seem to be still a long way from having this kind of universal library on the open system with access to global information resources which include the collections of the world's greatest libraries as well as others resources. We still need to pass many hurdles before we can reach this goal. What are these hurdles or barriers then?

## 2.2. Obstacles to Universal Access

On May 18, 1994, on my way to Moscow and then Crimea '94, I was reading an interesting feature article appearing in the *Wall Street Journal* (Ziegler, 1994) entitled "Building the Highway: New Obstacles, New Solutions." Ziegler stated that in order to deliver the promises, many challenges of unprecedented complexity and size will have to be met. These include areas related to data compression and storage, the servers, the conduit, the set-top box, the user interface, and the ordering and billing systems. Surprisingly, in short two years, most of those related to technical issues and programs have come closer to have possible solutions. Yet, the real barriers are generally not technical ones. They have a lot to do with the problems and issues related to the information infrastructure. As included in those identified in *Alexandria Declaration of Principles* (see Appendix I), resulted from the *NIT '94: International Conference on Planning Global Information Infrastructure* (Chen 1995), many barriers include those unsolved or difficult to solve issues such as:

- legal issues which arise with respect to copyright, intellectual property, privacy and confidentiality, personal and business equity, and security.
- the differences in culture, especially as reflected in the means for communication;
- generational gaps;
- the sheer complexity of information infrastructure -- global or national;
- adequate and effective inventory of available information resources that constitutes knowledge of information;
- ability to locate and retrieve quality and relevant information;
- the complex issues related to "undesirable" "indecent" information; etc...

The bottomline is that despite of these problems and unsolved issues, the skepticism on the hype and reality of our interactive future, one thing is very sure. With all the money bumping into this effort by big-time players, we will have a digital superhighway. Yes, the technologies will be soon available to enable us to link all the global information together to form "The Global Library" for

multimedia information delivery. But, are we ready to have our information resources available in digital form so that they can be linked together by utilizing the available technologies? All the products and services which attracted BIG investments in billions and millions of dollars are now related to the delivery of popular, game-like, and entertainment type of products. If so, is this digital information superhighway, which we are so much looking for, is more suitable to be called digital *entertainment* highway? To prevent this, information professionals like us need to build our own high-speed quality "cars" to ride on this highway. These are the new tasks. Here, for "high-speed," I mean "digital" or "electronic", and "quality," I mean content-based and knowledge-based, as well as multimedia and not just print-based. Have we begun to think about this and to plan to build this? This is the central question! It is high time for all information professionals, to think seriously on how to work toward that!

### 3. GLOBAL DIGITAL LIBRARY INITIATIVE

My long-time international involvement has prompted me to consider the information infrastructure development from a global angle. I have capitalized all possible opportunities opened to me throughout the years to present my concept of "Global Digital Library" (GDL). In one of my latest articles in *Microcomputers for Information Management: Global Internetworking for Libraries* (Chen, 1996), many of my intensified efforts in the last three years were detailed. These include:

- Presenting major speeches at several international meetings including
  - *Crimea '94* in Eupatory, Ukraine, organized by the Russian National Public Library for Science and Technology and the Ukraine Ministry of Culture,
  - the *NIT '94: The 7th International Conference on New Information Technology* in Alexandria, VA in November 1994;
  - the *NIT '95: The 8th International Conference on New Information Technology* in Riga, Latvia in November 1995;
  - the First China-US Conference on Global Library, Beijing, China, August 23, 1996
  - the Social Science Divisional Meeting at IFLA Meeting, Beijing, China, August 28, 1996, and now
  - the *NIT '96: The 9th International Conference on New Information Technology* in Pretoria, South Africa.

Clearly, this series of *NIT* conferences have played very key roles in my efforts to interact with library and information professionals from different part of the world.

- Organizing High-level International Brainstorming Sessions
  - In 1994, as the Clinton Administration in the U.S. made an impressive lead in coordinating the country's national information infrastructure (NII) effort and began the global information infrastructure (GII) activities on a governmental and macro levels, as an information professional, I devoted the entire *NIT '94* to this goal by

bringing together a small invited group of leaders of our field -- representing different countries, both developing and developed, different sectors of our society, and different governmental and nongovernmental organizations -- for an intensive soul-searching meeting in Alexandria, VA. To have a reality check on where we are in the global scene, *NIT '94* addressed the baseline and fundamental questions related to topics of the NII and GII, such as the definition; objectives and goals, problems, issues, and concerns related; etc. Several participants of NIT '94 are here at this meeting as well, and you will hear references made to this most productive meeting of the minds.

As a result, the *Alexandria Declaration of Principles* is (1995) available for wide distribution (Appendix 1), a 548-page book entitled *Planning Global Information Infrastructure* was published (Chen, 1995a), and a special issue of *Microcomputers for Information Management* which includes *Alexandria Declaration of Principles* and many major NII and GII documents are included. These publications provide invaluable source materials essential for the planning and development of GII.

- Taking advantage of the IFLA meeting, a GDL Initiative Meeting among national librarians of over 15 countries were called at the Tsinghua University in Beijing on August 25, 1996. This is a start of another initiative for more informal dialog and interactive among global library leaders and policy makes. Discussion groups over Internet will be organized soon.

- Publication Channels for Information Sharing and Distribution

- *Microcomputers for Information Management* has had a subtitle, "*Global Internetworking for Libraries*" since January 1995. This offers more coverage on some of the baseline problems and issues related to digital libraries and GII, including the promises of digital libraries, barriers and major challenges.

- Books and conference *Proceedings*.

- The GDL Prototype on the WWW

Riding on the knowledge and experience gained from the award winning multimedia product, *The First Emperor of China* (Chen, 1993, November), a prototype digital project on the global national libraries have been initiated in late 1993, with basic introductory source materials -- both text and images -- provided by over 30 national libraries around the world. In preparation for the growing use of Internet and WWW, two photo CDs with about 100 images of these national libraries on each CD were created, and a full-text CD with basic descriptive information on these libraries together with some selective images have also been created by using Knowledge Access International's Omni Search Publisher software. The products become invaluable resource materials which are ready for more ambitious WWW application development (Chen, 1995b).

More discussion on the system is described in the following as well as a recent article with an extensive graphic directory of many homepages of national libraries around the world linked together in the GDL Prototype (Chen, 1996).



#### **4. A SEAMLESS GLOBAL DIGITAL LIBRARY PROTOTYPE EXPERIMENT**

"The Internet as a context for deploying digital library systems offers an unprecedented opportunity -- not only technically by providing connectivity to an enormous potential user base, but also culturally, given the Internet community's models and traditions of technology diffusion through the distribution of publicly available prototype software -- to move ahead large-scale experiments" (Lynch & Garcia-Molina, 1996, p. 88). The report also defines the digital libraries as "systems providing a community of users with coherent access to a large, organized repository of information and knowledge" (p. 91).

In line with this definition, and in conjunction with the GDL initiative as described, since 1994 I have moved ahead with an experiment -- creating a seamless GDL prototype, starting with the world's national libraries, some major academic and research libraries; national museums, and national archives. These institutions of every country historically have been the archival repositories of the treasures and recorded memories of each country for generations. Each has provided information and cultural backbone to the citizens of that country and around the world. As traditional collections of these institutions are digitized and transformed to electronic files, their knowledge contents can then be integrated and remolded to different information products in multimedia electronic formats to meet the new global learning and information needs.

The current GDL prototype links the homepages of the following types of institutions together in one single global digital library system with a coherent and consistent interface:

- National Libraries
  
- National Archives
  
- Selective Museums of the World
  
- Selective International Organizations
  
- Selective Library and Information Networks
  
- Selective Local Digital Libraries

By linking them together in the GDL system, the user community can easily access any site by a simple click of the mouse, without having to search and open the site with the URL address of each location.

Figure 1 shows the homepage of GDL prototype, from where one can have access to information resources of national libraries of those countries included. If USA is selected, then immediately on the left side of the lower screen shows the image icons of the three national libraries of the U.S.A. - Library of Congress, National Library of Medicine, and National Agriculture Library.



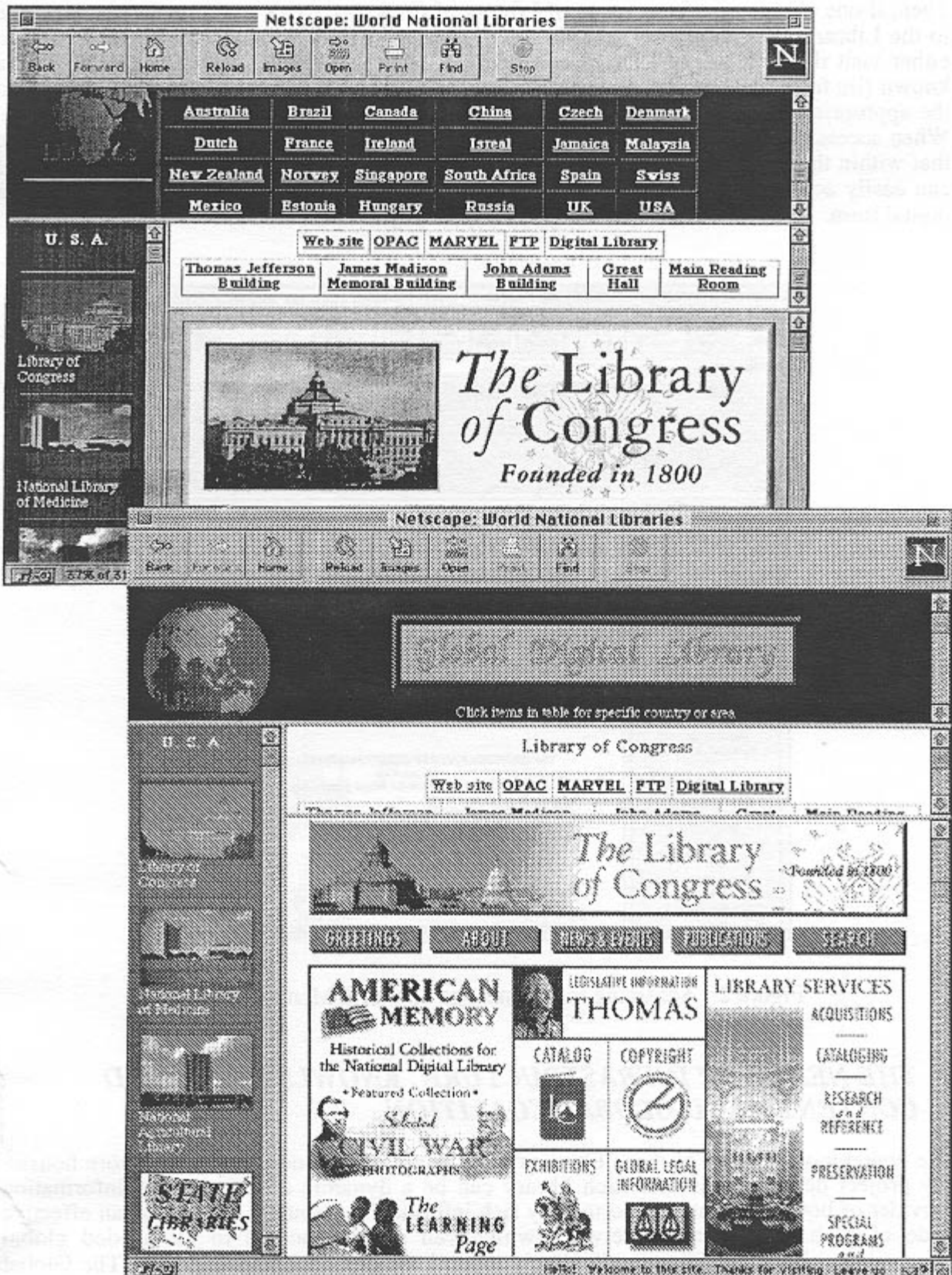


Figure 1. Accessing Library of Congress's American Memory via GDL



## ***5 THE NEED FOR INFRASTRUCTURE , KNOWLEDGE-BASED CONTENTS, AND GLOBAL COALITION***

The contemporary roles of these libraries have to go far beyond those of the store houses. My project demonstrates that each library can be a dynamic and aggressive information provider of both its country's enormously rich information resources, as well as an effective node of global information network which can provide access to all needed global information. Each contributes effectively toward the eventual realization of "The Global Library", in which national and research libraries in the world can be linked together as nodes of the worldwide information network.

Clearly, the GDL prototype system has demonstrated that provision of universal information access to a large number of world's digital libraries is technologically feasible. But, there are still many hurdles which we must jump over in order to have a real interoperable and functional GDL. These barriers, already discussed earlier, include standards, intellectual properties, copyright language barriers, security, funding, etc... and should not be ignored since they are central issues for any international cooperation.

The experience of this GDL prototype development thus far suggest the need for infrastructure development. It is also essential to form global coalition of major libraries and information organizations so that proper, substantive and higher-level cooperation on the development of the GDL is possible. With this coalition, libraries will be able to find ways collectively to address the following:

- How to make our information resources available in digital form so that they will be available for sharing digitally?
- What kind of funding is available for this essential work? How global coalition effort can help to maximize the limited resources?
- Which portion of our information resources can be shared without copyright restriction?
- If copyright applies, how do we find ways to share the digital information resources?
- How to enable the user community to find the quality digital library resources?

While it is certain that we will have the powerful information superhighway, we are far from having our valuable information resources available in digital form so that they can be linked together by utilizing the available technologies. Being available in digital format will be the first requirement. Unless information resources are available in digital format, there will be no digital libraries. Once the information sources are available in digital form, they can be accessed, distributed, and transmitted easily to end-users over the global information network, such as Internet.

Furthermore, the central concern to the endusers will have to be the authority and quality of content in digital libraries. Take the national libraries for example, the GDL prototype experiment has revealed vividly that although there are substantial numbers of national libraries which have homepages available, most do not have knowledge-based contents. Instead, they are mainly directional and informational in nature. While these are important, they are only "pointers", which

has to be linked further to the information itself, so that people can begin to learn and to engage further. Thus, there is a desperate need for quality content building.

Currently we have used the words *cruising* and *surfing* to describe our behavior on the Web, few have invoked the words *learning* or *engaging* when we browse or use the Web, as pointed out by Nicholas Negroponte (1996) . How can we possibly learn and engage when the type of information needed is not available (only in printed format and not "being digital") or the type of digital information available is not of high quality or not knowledge-based?

## 5. CONCLUSION

In the current networked environment, the knowledge world is going from a paper culture to an electronic one, and libraries will be deeply affected. In other words, printed information sources, such as books, journals, and archival materials, will not be enough. Digital information sources become essential. That's why more and more libraries are starting to create limitless digital bookshelves.

As we move further in this digital visual information age, the need for each country to develop its national and global information infrastructure and to digitize their information resources will increase sharply. In working toward this global information access, the principles outlined in the Alexandria Declaration of Principles will continue to serve as an effective checklist for successful development.

In spite of the potential difficulties, barriers, and challenges already mentioned here and elsewhere, one thing is certain that the technologies and the infrastructure are in place now for us to experiment on a universal library.

The Web is a digital landmark, as important as the net itself (Negroponte, 1996). The Web can create a new and more accessible subworld, like a window-shopping or market square experience. But, the Internet is now like a city - people can go places, and can visit communities, as Steve Case alluded to in referring AOL as a bigger "city" than San Francisco or Madrid. The Internet can bring the digital library to not just the local but the global community, and can enable everyone of that virtual community to interactive and engage him/herself in the process of sharing and creating new knowledge based on the information obtained. But now, when he/she arrives at a place and try to make things happen, the experience has been one of frustration and bewilderment.

Being at these crossroads, in addition to speculation on the libraries in the next millennium, we must make sure that we can develop in this seemingly exciting networked environment, a vision for our global library's future, and define its role in facing a new frontier. It is important for us to visualize that not only all types of libraries in our country would be connected to the super-network, but globally all libraries would be part of the network as well. In anticipating the growing demand to use the Net and the Web for more suitable purposes: communicating, learning, experiencing, the GDL prototype has been created to provide users with a window-shopping experience on the world's rich information resources. But thus far, going beyond the window dressing, there no been few deliverable "products" or "contents." We must have the real thing so that the library Net and Web users will not end up frustrated! This is a real challenge!

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## **Appendix 1. Alexandria Declaration of Principles**

### **GENERAL CONTEXT**

In November 1994, the *7th International Conference on New Information Technology, NIT' 94*, was held in Alexandria, Virginia. It brought together representatives from countries representing every region of the world and every stage in economic development. The focus of *NIT '94* was on planning the Global Information Infrastructure (GII), reflecting the emphasis given by the President of the United States to the effective use of new information technologies for the advancement of an international well-being. Speakers presented papers that provided a technical context for discussion of the social objectives, and the result of the discussions was a consensus of agreement on this *Alexandria Declaration of Principles* for development of the Global Information Infrastructure.

Although this *Alexandria Declaration of Principles* is derived from the *NIT '94* Conference, its focus is not on the new information technologies themselves or on what the series of *NIT* conferences should be doing; rather, it is intended to be a general document that many others can use, as well as the *NIT*. Furthermore, although the *NIT '94* Conference was convened in the United States, this *Declaration of Principles* is not intended to be solely a United States document but a global one. To some extent it is intended to serve as a checklist to identify issues that should not be overlooked and to state them without political implications.

Although the *NIT* conferences are not the focus in this Declaration of Principles, among the recommendations is that the *NIT* Conferences have been and could continue to be an effective means for accomplishing the objectives identified. In that sense it was recommended that a future *NIT* Conference might be conducted as a virtual conference, using modern means of electronic communication as an experimental way of reaching out to share critically needed information and to train.

### **THE NATURE OF THE GLOBAL INFORMATION INFRASTRUCTURE (GII)**

Before identifying the principles embodied in this *Declaration*, it is valuable to comment briefly on the essential elements of the *GII* that make it important and on what it provides that makes it different and unique.

The *GII* derives directly from the Internet as a worldwide network providing means by which individual persons can deal with its component subsystems. It is designed as a structure under which specific ideas will fit without making judgment on what the system should look like. It is intended to serve not institutions but individuals and communities to which they belong.

The *GII* is an open, self-organizing, interactive, resilient, interconnected system providing dynamic and democratic means for people not only to find information but also to put forward their own ideas for others to see. It is intended to be responsive to change - not resisting it but thriving on it.

## **STATEMENT OF PRINCIPLES**

The discussions during the Conference led to the formulation of the following principles:

### **PRINCIPLE 1. EMPOWER INDIVIDUALS**

The GII should be a means for empowering individuals through knowledge. Persons in many places and at any time can interact with the many different subsystems, and can be broadcasters as well as receivers.

In stating this principle, it is recognized that empowering individuals has the potential of creating political problems. On the one hand, in some political contexts, empowering citizens may pose a threat to established regimes and, on the other hand, those regimes may misuse the GII as simply another way to propagandize, abusing the information access channels to meet their own political agendas. There also may be social problems in the empowerment of individuals through knowledge. There is a large cognitive leap between providing access to knowledge and empowering individuals. Empowerment has many social and political implications.

In application, therefore, this principle should be used carefully and modestly.

### **PRINCIPLE 2. EDUCATE AND TRAIN IN USE**

A principle of crucial importance is the need to offer education and training in how to use information and the GII. There is a need to equip people with information-handling skills that will make them more effective as citizens and more productive as individuals. There is a need to help persons who are at risk because they lack the skills and to provide them with the tools to deal with information. Information literacy should be part of the educational system as a whole and seen as an investment in people.

### **PRINCIPLE 3. INCREASE KNOWLEDGE**

As part of the principle of empowering individuals, but with even broader significance, the GII should serve as a means for adding to the available knowledge, preserving it in forms that will serve each country and each group of peoples, and encouraging the use of it. By doing so, the GII should increase understanding and decrease exploitation. Among the valuable technical contributions to serving that objective is the incorporation of system architecture that allows for highly distributed applications and collections.

### **PRINCIPLE 4. DEVELOP LOCAL RESOURCES**

There is a disparity in the library and information holdings among individual countries, so some countries need to augment their holdings in very basic ways. In this respect, the need is not just for



more sophisticated finding aids or services but for the basic collections on which to build them. As a part of this principle, countries have a need for information produced outside of their countries; thus development of the GII requires ready availability to information that may be already available elsewhere.

As an equally important part of this principle, countries also have a need for information that they themselves produce. Each country has unique strengths, distinctive competencies that relate to its collections of knowledge as well as to its information skills and ability to produce goods and services. To develop those strengths, there is a need within each country for professional skills in the management of information to support the creation, organization, dissemination, and utilization of local knowledge resources.

#### **PRINCIPLE 5. IDENTIFY RESPONSIBILITIES OF INFORMATION PROFESSIONALS**

Librarians and other information professionals have crucial roles to play in development and implementation of the GII. The librarian serves as the preserver and caretaker of cultural heritage, by assuring that the record of the past will be available for the future. The library serves as an access point, without being the controller of the access. Librarians exemplify the underlying principles of the GII.

More generally, librarians and other information professionals are the means for assuring effective use of the resources of the GII. Beyond knowing how to find information, they know how to organize it and use it effectively. They can also be a means to develop uses and to help users benefit from them. In this respect, it is important to note that uses include not only highly sophisticated ones but those that help individuals cope with their own basic needs. Librarians have a special role in meeting the needs of the populations at risk, as intermediaries in accessing the GII and as navigators to the information.

#### **PRINCIPLE 6. EDUCATE THE INFORMATION PROFESSIONALS**

There is a need to educate the information professional to fill these roles. It requires college-level education, intense basic training programs, workshops, and conferences. The technology itself can provide opportunities and means, such as virtual or electronic conferences, that can reach out, expand, and enlarge the professional participation in GII.

In some respects, the content, curriculum, and standards need to be international; in that context there is a potential role for regional and international organizations to provide outlines and syllabi for the knowledge and skills information handlers need to have. In other respects, the content needs to emphasize local needs and resources.

#### **PRINCIPLE 7. BUILD FROM COUNTRY TO REGION TO INTERNATIONAL**

A central principle in this Declaration is that each country and each region should make its own decisions about the development of the GII. There should be no one recipe, no international mandate, but rather each country and society should develop its own system to become part of a larger network.

More specifically, there are real risks in imposing international objectives on national or regional entities; which can be illustrated by the failure of many international development programs that have brought experts to a country to create wonderfully designed projects that did not work in the context of the local political and economic situation.

To implement this principle, there is a need for long-range and short range strategic planning at national levels, for means internal to each country to prepare and coordinate such strategic plans and to translate them into programs and budgets.

A corollary is that a guide should be developed for such strategic planning, usable at both national and institutional levels, a tool to serve key policymakers and decision makers. It should serve as a map rather than a prescription of which road to travel to get to the destination.

### **PRINCIPLE 8. NATIONAL AGENCIES IN DEVELOPMENT**

There is a need for national agencies to play crucial roles in the development of the GII and in its transition into operation. First are the governmental agencies responsible for national legislation and planning. Second are nongovernmental agencies that serve as means to convince governments and people that information has value and to support them in implementing the necessary policies. Third are the major libraries of each nation - the places at which the core collections, services, and skills of information professionals and entrepreneurs may be concentrated. In some countries the national library may be the best focus as the key player in the GII; in others it may be major university libraries.

### **PRINCIPLE 9. PUBLIC/PRIVATE SECTOR COOPERATION**

In developing national plans, cooperation between the public and private sectors is crucial. On the one hand, government must have a role in the "public good" aspects, as economists use that term to refer to basic infrastructures and resources; public funding may well be required for basic operations and services. On the other hand, the private sector is in the best position to provide enhanced operations and services; within each country there needs to be a viable private sector with sufficient strength to produce the kind of information products and services that are available in more developed countries.

There should be a partnership between the government and the private sectors, with intensive collaboration between them and an infusion of the values of each sector into the other, so that they each understand, acknowledge, and respect if not adopt what the other can contribute.

### **PRINCIPLE 10. NEED FOR APPROPRIATE ECONOMIC POLICIES**

There is an increasing gap among various countries and societies, which has been exacerbated rather than relieved by the increasing role of information, in large part because there has been inadequate recognition of that role. To aid in reducing that gap there is a need, at the macroeconomic level, for national accounting that will support other principles, aid in development of national and regional information infrastructures, assist collaboration between public and private sectors, and foster the development of local resources.

At the microeconomic level, there is a need to recognize the distinction between information as a capital investment and information as an expenditure. It is clear that information and the GII have an economic role as capital resources in the creation of new information.

## **SPECIFIC ISSUES THAT NEED RESOLUTION**

In each of the components that make up the GII, there are issues that will need resolution; they constitute both barriers and opportunities, with one person's barrier being another's potential opportunity.

Among the issues is language. On the one hand, a lack of a common language creates fragmentation, not only locally, but globally; terminology of one country may not be understood or even appropriate in another. On the other hand, although this lack of a common language could argue for standardization, people want to preserve their languages, so they would argue for diversity and multiplicity. A principle therefore is that the development of the GII could be an opportunity to assure that the richness and diversity of languages be preserved in the system. In that sense, language is part of the infrastructure.

A whole set of issues revolve around technical requirements. Among them is the need for standards, such as commonly accepted formats, but not so constraining as to stifle development.

Legal issues arise with respect to copyright, privacy and confidentiality, personal and business equity, health and safety, and security.

There are issues raised by differences in culture, especially as reflected in the means for communication. There are issues related to generational gaps, with different perceptions between the older and the younger society members.

The affordability of information is clearly an issue. For some countries, the costs in shipping journals are frequently substantially more than the cost of the journals themselves. And the time it takes for delivery makes them out of date when they are available.

A critical issue is the sheer complexity of the GII. In this respect, there may appear to be too much information, too rich an array of resources. It is easy to get lost in the very process of retrieval, and difficult to get to the appropriate information. Every effort should be made to make it simpler and user friendly, to make it a little less complex to the end users, to simplify the user interface to the GII. There needs to be an infrastructure for the information ocean, and for each country it needs to be locally applied.

Even libraries are complex and very intimidating - particularly university libraries as well as local libraries.

There is need to develop an inventory, a directory of resources - not just a bibliography in the traditional library sense, but an information inventory that constitutes knowledge of information. This may need to be subsidized, because the commercial interests may completely overlook the need for these finding aids.